Synopsis of the Research Proposal entitled

Gender Differences in Mathematical Abilities and Achievements among Post Graduate Mathematics Students

Submitted to

Swami RamanandTeerthMarathwada University,

Nanded

In the subject

EDUCATION

Under the faculty of

Interdisciplinary Studies

By

Dr. K. L. Bondar
(M. Sc., M. Ed., Ph. D. (Maths), SET)

Under the Guidance of

Dr. N. H. Kulkarni,
Principal
R.B.M. College of Education,
Hatta, Tq: Basmat, Dist: Hingoli

Research Center

School of Education,

SRTM University, Nanded

Title of Topic: Gender Differences in Mathematical Abilities and Achievements among Post Graduate Mathematics Students

Introduction:

Mathematics is the oldest discipline among all sciences that have developed through the ages having a direct impact on the quality of human life on the world. Mathematics education is a vital tool for the understanding and application of science and technology. It plays the important role as a predictor of much needed technological developments in a nation. Like the other developing nations India realized the significant role of Mathematics towards the nation building and therefore made the subject compulsory up to secondary level.

At various times, people have believed the following differences as based on inborn characteristics.

- Women are less intelligent than men.
- Women are less capable (because of general, physical fragility), of studying at high intellectual levels.
- Men are good at mathematics and physical sciences, women at languages and verbal performances.
- Objective intelligent testing does not support that females are less intelligent.

Currently there is a big movement in India to try to address the issues of gender equity. Affective action in favour of women is now being practiced in both the private and public sector as well as in educational institutions. In spite of efforts to afford both female and male students, equal opportunity in education, it has been alleged that this is not being extended to or achieved in practice for all the subjects in the curriculum and to mathematics in particular.

The issue of sex differences in Mathematical problem solving has been raised often, especially in the popular press. For example, in 1980,'Newsweek'run a story entitled, "Do males have a math gene?"and the same week,'Time' devoted a page to"The gender factor in Math". Inspite of the occasionally intense public attention and strong opinions sometimes given in popular publications, it is possible to examine sex differences issue from a scientific point of view. In particular, two related questions

can be raised: 1.Are there sex differences in student's scores on test of Mathematical ability and achievement? 2.If so, why are the differences?

Review of Literature:

Mathematics is a science subject and some gender-based science researchers have reported that what both the 'feminist empiricists' and the 'liberal feminist critics' seem to agree is that females in principle will produce exactly the same scientific knowledge as males provided that sufficient rigour is undertaken in scientific inquiry (Howes, 2002; Barton, 1998; Sinnes, 2006). They also believe that initiatives that build on the assumption that females and males are equal in their approach to science, and that inequality in science and science education is caused by political, educational and social factors external to science, would be expected to focus on removing these external obstacles. There is need therefore to give boys and girls exactly the same opportunities and challenges. Although, Forgasz and Leder (1996) noted that the related literature reveals inconsistent findings, other researchers such as Kimball (1989) and Peterson and Fennema (1985) found that gender differences in mathematics are related to teacher behavior and classroom climate. And, in addition Fennema et al. (1990), stated that one component of the external influences, which may affect the development of gender related differences in mathematics would be the teacher influence on both students' internal motivational beliefs and on students' participation in classroom learning activities.

Popular cultures view rural education as a deficit model (Hopkins, 2004), whereas others hold the view that there is no difference between rural and urban education (Howley, 2002).

One of the earliest works which analysed differences across gender in terms of mathematical scores is the one by Benbow and Stanley (1980) who found „sex differences" in mathematics using the math component of the SAT examination, which is a standardized test for college admission in the United States. Eccles and Jacobs (1986) questioned the study on many fronts. Firstly scores in the SAT examination may not an appropriate measure of mathematical aptitude. Secondly the students who took the tests may not have similar learning experiences. Finally they also questioned the conclusion on reasons for females taking fewer math courses to be due to sex differences in mathematical reasoning. They find that a lot of it is

influenced by perception of parents of the mathematical ability of their child and the value they ascribe to mathematics as a subject. Mother's belief and confidence would have an even greater influence which is more susceptible be impacted negatively through media reports attributing these differences to the innate abilities and biological factors.

Fryer and Levitt (2010) find no difference in math scores between boys and girls in the United States upon entry to school but an emergence of gender gap is found in early years of schooling. They find parental expectations with regards to math be lower for girls and even for girls whose mothers are in math-related professions, the results do not change. Bharadwaj et al. (2016) also find the existence of gender gap in mathematics using data across low and middle income countries and find the emergence of this gender gap in scores to come by 4th grade. Similar results were found in Baltimore and Chile as well (Entwisel et al. 1994; Bharadwaj et al. 2016).

There is growing evidence which shows learning outcomes play a major role in shaping up individual earnings, development and hence quality of life (Hanushek and Woessemann, 2008; Stiglitz et al. 2010). Among various subjects, performance in mathematics is positively associated with higher earnings for an individual (Mulligan, 1999; Lazear, 2003). Studies have also found that female students report high anxiety over mathematics than the male students (Stoet et al., 2016). These differences might lead to a significant drop in skills developed by a female student and further affect performance in mathematics and related subjects, which negatively affect future earnings and their economic wellbeing.

Objectives of the Study:

- To find out the gender differences of post graduate students in mathematical ability in cognitive, affective and psychomotor outcomes.
- To find the factors that lead to gender differences in mathematical ability.
- To verify whether parental socio economic status and college proprietorship are significant factors in the students' Mathematics achievement.
- To study the achievements of the post graduate mathematics students studying in the departmentsof colleges/University in the Swami RamanandTeerth University Nanded region.

Hypothesis of the Study:

The following null hypotheses are hereby stated:

H1: There is no significant difference between the Mathematics achievement and mathematical abilities of male and female students in post graduates mathematics departments under Swami Ramanand Teerth Marathwada University, Nanded.

H2: The parental socio economic status is not a significant factor in Mathematics achievement and mathematical abilities of male and female students in post graduates mathematics departments under Swami Ramanand Teerth Marathwada University, Nanded.

H3: The institutional proprietorship is not a significant factor in the Mathematics achievement and mathematical abilities of male and female students in post graduates Colleges under Swami Ramanand Teerth Marathwada University, Nanded**.**

Need and Significance of the Study:

Gender differences in this study refer to the cognitive differences, affecting differences and psychomotor ability differences that are found among the two sexes. The cognitive differences refer the'cognitive constructs' viz. academic achievement, spatial visualization ability and logical reasoning ability of boys and girls. The affective differences refer the 'Attitude towards mathematics, value for mathematics and attributional styles of the sexes. The psychomotor differences indicate the'Drawing skills and modeling skills' of the boys and girls.

Mathematical ability is the Individual psychological characteristics that answer the requirements of mathematical activity and that influence success in the creative mastery of mathematics as a subject in particular a relatively rapid, easy and thorough mastery of knowledge, skills and habits in mathematics.

Methodology:

Selection of sample: The sample survey method is chosen for the present study.

Analysis of data: The collected data will be systematically arranged in tabular form and then analyze with statistical tools.

Use of questioner, tests will be conducted.

Coverage of the Study

The present study is an attempt to find out the possible answers to the cited questions in the Indian context and post graduate mathematics students. Moreover an attempt is being made to study the achievements of the post graduate mathematics students studying in the departmentsof colleges/University in the Swami RamanandTeerth University Nanded region.

The choice of this topic is predicated on the current world trend and research emphasis on gender issues following the millennium declaration of September 2000 (United Nations, 2000) which has as its goal, the promotion of gender equity, the empowerment of women and the elimination of gender inequality in higher education. It is believed that bridging gender gap is one major way of achieving egalitarianism and enhancing human development. Hence one is led to wonder whether gender disparities exist in the Mathematics achievement of post graduate mathematics students in said university region. It is also the objective of this study to verify whether parental socio economic status and school proprietorship are significant factors in the students' Mathematics achievement.

Statistics to use

To verify the differential hypotheses't'test is to use. To test the relational hypotheses we use 'r'test. To find the interactive effect;'F'test will be used. To identify the factors that influence mathematical ability factor analysis is to be done. To study the effect of learners attributional style on mathematical ability $\chi 2$test is to use. To discriminate the from one another discrimination analysis is to be done. Multiple regression will be calculated and equation will be found.

Limitations of the Study:

In this study, Gender differences does not indicate the sex differences in the Biological sense but in the intellectual abilities.

Year wise planning of the work

First Year: Collection of references, review of literature, completion of course work, and other required steps for the study**.**

Second year: The gender differences of post graduate students in mathematicalability in cognitive, affective and psychomotor outcomes will be studied. The factors that lead to gender differences in mathematical ability will be discussed.To verify whether parental socio economic status and college proprietorship are significant factors in the students' Mathematics achievement. Using various statistical tests conclusions will be drawn. Work will be published in reputed journals.

Third year: Study of the achievements of the post graduate mathematics students studying in the departmentsof colleges/University in the Swami RamanandTeerth University Nanded region. Using various statistical tests conclusions will be drawn.Work will be published in reputed journals. Work will be presented in conferences and seminars. Submission of work to university.

References:

[1] Barton, A. C. (1998). Feminist Science Education. New York: Teachers College Press.

[2] Benbow, C. P., & Stanley, J. C. (1980). Sex differences in mathematical ability: Fact or artifact?. Science, 210(4475), 1262-1264.

[3] Bharadwaj, P., De Giorgi, G., Hansen, D., & Neilson, C. (2012). The gender gap in mathematics: Evidence from low-and middle-income countries (No. w18464). National Bureau of Economic Research.

[4] Eccles, J. S., & Jacobs, J. E. (1986). Social forces shape math attitudes and performance. Signs: Journal of women in culture and society, 11(2), 367-380.

[5] Fennema, E.; Peterson, P. and Carpenter, T. 1990, 'Teachers' Attributions and beliefs about girls, boys, and Mathematics, Educational Studies in Mathematics, 21(1): 55-69.

[6] Forgasz. H. and Leder G. (1996): Mathematics classrooms, gender and affect, Mathematics Education Research Journal, 8 (1): 153-173.

[7] Fryer, R. G., & Levitt, S. D. (2010). An empirical analysis of the gender gap in mathematics. American Economic Journal: Applied Economics, 2(2), 210-240.

[8] Hanushek, E.A. and L. Woessmann, L. (2008). The Role of Cognitive Skills in Economic Development. Journal of Economic Literature, 46(3), 607-668. DOI: 10.1257/jel.46.3.607

[9] Hopkins, T. M. (2004). Gender issues in Mathematics' achievement in Tennessee: Does rural school locale matter? A Ph.D. dissertation, University of Tennessee, Knoxville. Howes,

[10] Howes, E. V. (2002). Connecting girls and science. Constructivism, feminism, and education reform. New York: Teachers College Press.

[11] Howley, C. (2002). Research about Mathematics achievement in rural circumstance. Working paper, No. 4. Athens: Ohio University, Appalachian Collaborative Centre for the study of learning, assessment and instruction in Mathematics.

[12] Kimbal, M. (1989): A new perspective on women's Math achievement. Psychological Bulletin, 105, 198-214.

[13] Lazear, E. P. (2003). Teacher incentives. Swedish Economic Policy Review,10(2), 179-214.

[14] Peterson, P. L., and Fennema, E. (1985) Effective teaching, student engagement in classroom activities, and sex-related differences in learning mathematics, American Research Journal, 22, 267-288.

[15] Sinnes, A. T. (2005). Approaches to gender equity in science education. Two initiatives in sub-Saharan African seen through a lens derived from feminist critique of science.Oslo:Unipub. http://www.ils.u10.no/forskninig/palidrgrad/doktorarhandlinger/docs/AstridSinnesAvhandlingfeministcritque of science.oslo: Unipub.pdf.

[16] Stiglitz, J. E., Sen, A., &Fitoussi, J. P. (2010). Report by the commission on the measurement of economic performance and social progress. Paris: Commission on the Measurement of Economic Performance and Social Progress.

[17] Stoet, G., Bailey, D. H., Moore, A. M., & Geary, D. C. (2016). Countries with higher levels of gender equality show larger national sex differences in mathematics anxiety and relatively lower parental mathematics valuation for girls. PloS one, 11(4), e0153857.

[18] United Nations (2000). U. N. millennium declaration 55/2 resolution adapted by the general assembly, September 18, 2000. http://www.un.org/milleniumgoals/.

Dr. K. L. Bondar
(Research Scholar)

Dr. N. H. Kulkarni
(Research Guide)